

larvae under local conditions, and finding its utility in limited bodies of water free from vegetation, has stocked all the wells in the malarial districts with a limited number of fish. The Health Unit is contemplating the extension of this scheme to other malarial centres as well.

GOURAMI.

The Department of Marine Biology and Fisheries has now undertaken to introduce the Giant Gourami, (*Osphronemus gourami* Lacépède), into the State, and the preliminary arrangements such as the construction of the pond system, etc., are in progress. It is proposed at present only to experiment on the possibilities of acclimatizing the fish over here, and later on the basis of these experiments it is proposed to launch out a commercial project. This fish, as mentioned in an earlier part of this note, is a native of the Malay Archipelago and is essentially vegetarian and therefore neither predaceous nor cannibalistic. Being a labyrinthine fish, it is able to carry on aerial respiration as well as to resist considerable pollution of water. On account of such simple habits and extreme adaptability, it has earned the name of 'poor man's fish'. It was introduced into Madras in 1886 and there is no reason why it should not be a success here too. Dr. A. W. C. T. Herre, of Stanford University, California, who had done a lot of work on this particular fish, was on a visit to this country in January 1941, and when consulted on this subject remarked that the topographical and meteorological conditions of this country being almost identical with that of the Philippines; acclimatization of Gourami is bound to be a success. If this proves correct, it may enable us, to a considerable extent, to make such a cheap and nutritious article of food as fish, accessible even to the poor living in the interior of the country.

In concluding, I have to express my deep indebtedness to Mr. E. H. Francis of the Kannan Devan Hills Produce Ltd., and to Mr. W. S. S. Mackay, Hon. Secretary of the High Range Angling Association for kindly placing at my disposal some valuable data regarding trout in the High Range, and also to Dr. C. C. John, Professor of Marine Biology and Fisheries for kindly going through the manuscript of this note and making necessary corrections.

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TRIVANDRUM,

TRAVANCORE,

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XII.—ON THE ROLE OF *ETROPLUS SURATENSIS* (BLOCH) AND *ETROPLUS MACULATUS* (BLOCH) IN THE CONTROL OF MOSQUITOES.

The use of fishes in the control of mosquitoes varies according to their feeding habits. Certain herbivorous species are helpful in

clearing the weeds from the water thus making the place less suitable for the breeding of mosquitoes, while some carnivorous fishes destroy the larvae by preying upon them. Stomach contents of several fishes, which are considered as larvicidal, have often shown only very low percentage of mosquito larvae. Such instances have led different authors to doubt the use of fishes in the biological control of mosquitoes. It is, however, not enough if attention is paid only to the amount of larvae that a fish eats, as certain fishes with snapping habits are also helpful in destroying larvae though they may not leave any evidence in their gut of their larvicidal activity.

Most fishes snap at objects of suitable size, possibly to test their edibility. Those not to the taste of the fish are spat out. Certain fishes, whether carnivorous or not, have a tendency to snap at any moving object whether worm, insect larva, or even a floating fibre. When they see anything moving near, they snap at it, take it into the mouth and spit it out, doing this several times before they finally swallow the object or discard it. Perhaps this is done to discover whether the object snapped at is edible or not and, if edible, to ensure thorough killing before it is finally swallowed. This treatment no living larva could survive.

I can illustrate this from observations made on *Etroplus suratensis* and *Etroplus maculatus*.

The Irwin Park, Ernakulam (Capital of Cochin State), is situated on the eastern shore of the Cochin Backwaters facing the harbour. At the southern end of this park there are two lotus ponds. Each has a diameter of about 20 feet and a depth of 6 feet, and their sides are plastered with cement. Both ponds are always full of water, although in the very hot months the water level goes down sometimes to half its depth. In one of these ponds the gardener had put in two *Etroplus suratensis*, which grew to a size of about 7 inches from snout to tail. These fishes were a special attraction to the visitors in the park because they were so tame that they came near anybody who made a splash in the water. They showed no signs of fear and snapped at everything that was thrown in the water, such as petals of flowers, grass blades, paper pieces etc. Several people had the nasty habit of spitting into the water, especially when chewing *pansupari*, and the fishes snapped at the objects that were spat in. They also snapped at one's fingers if dipped in the water, and it was possible to lift them partly above the surface if the finger was raised just at the time of snapping! In the evenings the pond was surrounded by people, and it was really interesting to see fishes as familiar with visitors as monkeys and deer in a zoo.

This was an observation I was able to make in 1938. Since then the fishes have disappeared from the pond for reasons unknown. Perhaps, they may have been carried away by somebody, or have died in the hot months for want of adequate protection from the sun. There is also the possibility of premature death, as the people who played with the fishes may have worried them too much.

From the behaviour described above, it is evident, that *E. suratensis* will not spare mosquito larvae appearing before them.

As it required elaborate arrangements to conduct further experiments on *E. suratensis*, I selected *E. maculatus* for the purpose, because it is small in size and very commonly met with along the shores of the brackish water areas. Even though this is a carnivorous fish, mosquito larvae do not form an important constituent of its diet. During low tide *E. maculatus* gets temporarily confined to pools of water in the small canals adjoining the mudbanks of brackish water regions. Into such a pool, a fingerbowl of water containing mosquito larvae was thrown in and carefully watched. As the larvae wriggled up and down, the fishes became very active and began to prey upon them, even though the prey was snapped at and thrown out several times before actual swallowing was done. Some larvae went down to the bottom without any movement which was proof enough to show that snapping had the effect of killing.

These observations go to prove that in judging the larvicidal value of fishes, their snapping propensities should also receive due consideration, this would throw new light on the utility of many larvicidal fishes, whose stomach contents show only stray cases of mosquito larvae, and which now appear seemingly unimportant. Hence, when mosquitocidal fishes are classified broadly as predatory, carnivorous, herbivorous etc., it is necessary to include those with pronounced snapping habits.

There are about twenty *E. suratensis* now growing in another tank situated in the centre of the Irwin Park, Ernakulam. This tank is bigger and deeper with a 2-foot-high masonry wall built around, so that people have not the chance of touching the water. These fishes are each about five inches long, and very active in snapping at objects falling into the water. Visitors to the park have their usual pastime of throwing in leaves, petals, etc., and it is interesting to see several of the fishes struggling at one spot to snap at any object thrown in.'

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MADRAS,

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XIII.—STAG BEETLES (*LUCANUS LUNIFER*) IN COMBAT.

I was walking along a hill path about 10 a.m. one morning and as I was passing under an oak tree I heard a loud and irregular sort of clicking noise. I looked up and located the sound and found it came from two male stag beetles, which were locked together in fierce combat on the moss, on the underside of a branch about 12 to 14 feet from the ground. I watched them for some minutes and found the loud clicking noise was due to their efforts to get a better and more powerful grip on each other with their jaws. Eventually I knocked them off the branch with a long stick on to the ground. When I went to pick them up I found a third beetle, obviously a female of the same species, had fallen off the branch along with the two males, although I had not perceived her presence until then, as she must have been hidden in the moss. I can think of no other